CHM129

Stoichiometry

1. Balance the following chemical equation. What type of reaction is it?

$$2\ AgNO_{3\ (aq)} + Na_2CO_{3\ (aq)} \rightarrow 2\ NaNO_{3\ (aq)} + Ag_2CO_{3\ (s)}$$

Double Displacement Reaction
(also Precipitation Reaction)

2. Find the molar masses of $AgNO_3$, Na_2CO_3 and Ag_2CO_3?

$AgNO_3$:
$1 \times Ag = 1 \times 107.87\ g/mol = 107.87\ g/mol$
$1 \times N = 1 \times 14.01\ g/mol = 14.01\ g/mol$
$3 \times O = 3 \times 16.00\ g/mol = 48.00\ g/mol$
$169.88\ g/mol$

Na_2CO_3 :
$2 \times Na = 2 \times 22.99\ g/mol = 45.98\ g/mol$
$1 \times C = 1 \times 12.01\ g/mol = 12.01\ g/mol$
$3 \times O = 3 \times 16.00\ g/mol = 48.00\ g/mol$
$105.99\ g/mol$

Ag_2CO_3 :
$2 \times Ag = 2 \times 107.87\ g/mol = 215.74\ g/mol$
$1 \times C = 1 \times 12.01\ g/mol = 12.01\ g/mol$
$3 \times O = 3 \times 16.00\ g/mol = 48.00\ g/mol$
$275.75\ g/mol$

3. How many moles of Ag_2CO_3 will be produced when 3.0mol $AgNO_3$ are consumed in an excess of Na_2CO_3?

$$3.0\ mol\ AgNO_3 \left(\frac{1\ mol\ Ag_2CO_3}{2\ mol\ AgNO_3}\right) = 1.5\ \underline{mol\ Ag_2}CO_3$$

4. How many grams of $AgNO_3$ are required to completely react with 2.65g of Na_2CO_3?

$$2.65 g\ Na_2CO_3 \left(\frac{1\ mol\ Na_2CO_3}{105.99\ g\ Na_2CO_3}\right)\left(\frac{2\ mol\ AgNO_3}{1\ mol\ Na_2CO_3}\right)\left(\frac{169.88\ g\ AgNO_3}{1\ mol\ AgNO_3}\right) = 8.49 g\ AgNO_3$$

5. (a) How many grams of Ag_2CO_3 will be produced when 5.32g of $AgNO_3$ react with 3.47g of Na_2CO_3? What is the limiting reagent?

$$5.32 g\ AgNO_3 \left(\frac{1\ mol\ AgNO_3}{169.88\ g\ AgNO_3}\right)\left(\frac{1\ mol\ Ag_2CO_3}{2\ mol\ AgNO_3}\right)\left(\frac{275.75\ g\ Ag_2CO_3}{1\ mol\ Ag_2CO_3}\right) = 4.32 g\ Ag_2CO_3$$

$$3.47 g\ Na_2CO_3 \left(\frac{1\ mol\ Na_2CO_3}{105.99\ g\ Na_2CO_3}\right)\left(\frac{1\ mol\ Ag_2CO_3}{1\ mol\ Na_2CO_3}\right)\left(\frac{275.75\ g\ Ag_2CO_3}{1\ mol\ Ag_2CO_3}\right) = 9.03 g\ Ag_2CO_3$$

$AgNO_3$ is the limiting reagent

Ag_2CO_3 produced : 4.32g

(b) If 3.18g Ag_2CO_3 were obtained by this reaction. What is the percent yield?

$$\%\ yield = \frac{\text{Actual Yield}}{\text{Theo. Yield}} \times 100$$

$$= \frac{3.18 g}{4.32 g} \times 100 = 73.6\%$$